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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/473,988    12/29/99    INQUE

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EXAMINER

MMC2/0227

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ART UNIT

PAPER NUMBER

2814  
DATE MAILED:

02/27/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.

09/473,988

Applicant(s)

INOUE ET AL.

Examiner

Theresa T Doan

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

## Status

- 1) ☒ Responsive to communication(s) filed on 06 December 2000.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9,20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some \* c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☒ received.
2. ☐ received in Application No. (Series Code / Serial Number) \_\_\_\_\_.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

## Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.

- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_.

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## DETAILED ACTION

### *Claim Objections*

1. Claim 1 is objected to because of the following informalities:

Claim 1 recite the limitation "...composition containing SiN...". Do you mean composition containing SiH?

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-9 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 8 recite the limitation "...first insulating layer...has been formed to cover said conductive film". It is not correct since according to figure 1D, the first layer 12 is not covered the conductive film 1. Correction is required.

Claims 2, 7 and 9 recite the limitation "a threshold". What is meant by threshold? The claim also states "...said insulting layer abruptly decreases upon a sight increase in the SiH content exists in the relation between said SiH content of said insulating layer and said degassing amount from said insulating layer, and said insulating layer has a SiH content not less than said threshold". This is not understood.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

5. Claims 1-2 and 9 are rejected under 35 U.S.C. 102 (e) as being anticipated by Shields (U.S. Pat. 5,958,798).

With respect to claim 1, Shields discloses in figure 5 a semiconductor device comprising:

an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH;

and shows a HSQ layer with 70% - 90% SiH bonds which is equivalent to an H content of not less than 15.4 atom % in the composition (column 4, lines 60-61).

With respect to claims 2 and 9 in so far as they are understood, Shields discloses an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH, and insulating layer has an SiH content of 70%-90%.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798).

With respect to claim 3, Shields discloses a contact hole for exposing part of a surface of conductive film is formed, and an interconnection layer electrically connected to the conductive film through the contact hole and the contact hole has a moderately tapered upper wall surface at the portion corresponding to the second insulating layer (see figure 5).

Shields does not show the second insulating layer has a multi-layer structure made up from layers of the same material. Since, the second insulating layer has a multi-layer structure made up from layers of the same material. Therefore, it considers a single layer as shown in figure 5 of Shields.

8. Claims 4-5 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Brennan (U.S. Pat. 5,998,297).

With respect to claims 4-5, Shields teaches an insulating interlayer 52 formed on a conductive film 59 and including an insulating layer of a composition containing SiH, and shows a HSQ layer with 70% - 90% SiH bonds which is equivalent to an H content of not less than 15.4 atom % in the composition (column 4, lines 60-61).

Shields does not teach a semiconductor element is provided on a semiconductor substrate, and the conductive film is formed over the semiconductor element and electrically connected to the semiconductor element. However, Brennan teaches the semiconductor element 12 is provided on a semiconductor substrate 10, and the

conductive film is formed over the semiconductor element and electrically connected to the semiconductor element (see figure 1c). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to apply the Brennan technique to Shields to obtain a connection capability.

9. Claims 7-8 and 20 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Wollesen (U.S. Pat. 5,900,668).

With respect to claim 7, in so far it is understood and 8, Shields shows a basic interconnect structure. Shields does not teach a semiconductor element formed on a semiconductor substrate, and a multilayered interconnection structure formed over semiconductor element and electrically connected to the semiconductor element, wherein the multilayered interconnection structure is an interconnection structure of at least two layers in which a conductive film or a lower interconnection layer and an upper interconnection layer formed on an insulating interlayer are electrically connected through a contact hole formed in the insulating interlayer. However, Wollesen teaches a semiconductor element 6 formed on a semiconductor substrate 1, and a multilayered interconnection structure formed over semiconductor element 6 and electrically connected to the semiconductor element, wherein the multilayered interconnection structure is an interconnection structure of at least two layers in which a conductive film or a lower interconnection layer 10 and an upper interconnection layer 13 formed on an insulating interlayer 7 are electrically connected through a contact hole 9 formed in the insulating interlayer (see figure 2). Therefore, it would have been obvious to one having

ordinary skill in the art at the time of the invention was made to apply the Wollesen technique to Shields to obtain an interconnect capability.

With respect to claim 20, Shields discloses a contact hole 54 for exposing part of a surface of the conductive film 51 is formed, an interconnection layer electrically connected to the conductive film through the contact hole 54 is formed, the contact hole has a moderately tapered upper wall surface at the portion corresponding to the second insulating layer 52 (see figure 5, column 7, lines 1-3).

Shields does not show the second insulating layer has a multi-layer structure made up from layers of the same material. Since, the second insulating layer has a multi-layer structure made up from layers of the same material. Therefore, it considers a single layer as shown in figure 5 of Shields.

10. Claim 6 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Shields (U.S. Pat. 5,958,798) in view of Brennan (U.S. Pat. 5,998,297) and further in view of Yu (U.S. Pat. 6,069,383).

With respect to claim 6, as discussed above, the combination of Shields and Brennan show the basic structure. Yu further shows the semiconductor element comprises a memory cell having a floating gate 33 formed on a tunnel insulating film 32 on the semiconductor substrate 31, a control gate 35, and a source 39a and a drain 39b formed in surface regions of the semiconductor substrate (see figure 3B). It would have been obvious to one having ordinary skill in the art to apply the interconnect technique to a memory cell.

***Response to Arguments***

Applicant's arguments filed 12/06/2000 have been fully considered but they are not persuasive.

Applicant's remark, page 5, argues that "from figure 5, the HSQ layer is not formed on the metal feature 51". The argument is not deemed to be persuasive because Shields discloses the HSQ insulating layer 52 formed on a conductive film 59 (see Figure 5).

Applicant's remark, page 6, argues that "Shields does not disclose the claimed threshold". It is not understood what applicant is trying to claim, see 112, 2<sup>nd</sup> Rejection above.

Applicant's arguments, addressed to the amended claims are considered in the rejections shown above.

In view of the foregoing, it is believed that the rejection of claims 1-9, and 20 under 35 USC 102 and 103 are proper.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the



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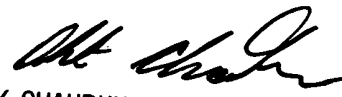
shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T. Doan whose telephone number is (703) 305-2366. The examiner can normally be reached on 8:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, OLIK CHAUDHURI can be reached on (703) 308-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Theresa Doan  
Patent Examiner  
February 26, 2001

  
OLIK CHAUDHURI  
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